REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1, 4, 6, and 9 are presently active in this case. Claims 1 and 6 have been amended and Claims 2, 3, 7, and 8 have been canceled without prejudice or disclaimer by way of the present amendment.

At the outset, the Applicants note that the reference "AW" cited in the Information Disclosure Statement (IDS) filed on December 12, 2003, has not been indicated as being considered. The Official Action indicates that the IDS filed on December 12, 2003, failed to comply with 37 CFR 1.98(a)(3) because it did not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent or publication listed that is not in the English language. The Applicants respectfully disagree, and submit that the IDS filed on December 12, 2003, did comply with 37 CFR 1.98(a)(3). The IDS was filed with a copy of the International Search Report in which the AW reference was cited. The International Search Report included on the continuation of the second sheet of Form PCT/ISA/210 a listing of the AW reference as a Category "Y" document, and a translation of the categories that indicates that a Category "Y" document is a "document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art." MPEP 609 III.A.(3) specifically indicates that such a submission satisfies the requirement for a concise explanation of relevance. Accordingly, the Applicants respectfully request an indication that the AW reference has been received and

considered. Additionally, the Applicants respectfully request that the IDS filed on September 30, 2004, has been received and considered.

In the outstanding Official Action, Claims 1-3 were rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al. (U.S. Pub. No. 2002/0164417). Claims 1-4 were rejected under 35 U.S.C. 103(a) as being unpatentable over Rigney et al. (U.S. Patent No. 6,274,193). Claims 6-9 were rejected under 35 U.S.C. 103(a) as being unpatentable over Khan et al. or Rigney et al. in view of Sangeeta et al. (U.S. Patent No. 6,485,780). For the reasons discussed below, the Applicants traverse the obviousness rejections.

The basic requirements for establishing a *prima facie* case of obviousness as set forth in MPEP 2143 include (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, (2) there must be a reasonable expectation of success, and (3) the reference (or references when combined) must teach or suggest <u>all</u> of the claim limitations.

The Applicant submits that a *prima facie* case of obviousness has not been established in the present case because (1) the references, either taken singularly or in combination, do not teach or suggest all of the claim limitations, and (2) there is no suggestion or motivation to modify the references to arrive at the present invention.

Claim 1 of the present application recites a method of repairing a Ni-based alloy part having an undercoat layer and a topcoat layer stacked on a Ni-based alloy base when the topcoat layer is damaged. The method comprises the steps of removing a damaged portion of the topcoat layer and a denatured portion of the undercoat layer corresponding to the damaged portion, forming another undercoat layer in a removed portion where the original

undercoat layer has been removed by spraying performed in the atmosphere at a spray particle speed of 300 m/s or more and a base-material temperature of 300°C or less, and forming another topcoat layer where the topcoat layer has been damaged. A layer formed of a material having excellent oxidation resistance is used as the other undercoat layer, and a layer formed of a material having excellent oxidation resistance is used as the other topcoat layer.

The Khan et al. reference describes a method for removing and repairing a topcoat layer and an undercoat layer, and a ceramics containing zirconia is included in the topcoat layer and the undercoat layer. (See paragraphs [0021] and [0022].) If zirconia is included in the undercoat layer consisting of MCrAIY, the undercoat layer becomes thin. This is due to a function of the undercoat layer, that is, as the thermal expansion coefficients of the base material consisting of metal and the topcoat layer consisting of ceramics are large, the removal of the topcoat layer is avoided. On the other hand, in the repair method of the present invention, the undercoat layer and the topcoat layer are clearly repaired separately.

The Khan et al. reference defines a method for spraying a slurry including a binder, and is different from the method of plasma spraying of the present invention. For example, paragraph [0014] of the Khan et al. reference describes the temperature for drying the slurry coating, and the temperature for removing the halogens including the binder. These conditions are required, as the Khan et al. reference uses a slurry method, and the conditions are not related to the conditions of the present invention. That is, the spray particle speed and the base-material temperature of the present invention have been set to avoid an oxide film being deposited on the undercoat layer, and to avoid the base-material being damaged with heat. Further, the present invention makes repairs using a material that is not necessarily

same as the original material to improve durability.

Furthermore, as noted in the Official Action, the Khan et al. reference does not teach or even suggest several features recited in Claim 1 of the present application. For example, the Official Action notes that the Khan et al. reference does not disclose or suggest a method including forming another undercoat layer in a removed portion where the original undercoat layer has been removed by spraying performed in the atmosphere at a spray particle speed of 300 m/s or more. In fact, the Khan et al. reference makes no mention of any spray particle speed. Furthermore, the Official Action notes that the Khan et al. reference does not disclose a method including forming another undercoat layer in a removed portion where the original undercoat layer has been removed by spraying performed in the atmosphere at a base-material temperature of 300°C or less. However, the Official Action states that in the absence of a showing of criticality, the selection of optimum values for the temperature and spray velocity would have been within the skill of one practicing in the art.

MPEP 2144.05 III. B. states that only result-effective variables can be optimized. This section notes that "[a] particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." (MPEP 2144.05 III. B. citing *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (The claimed wastewater treatment device had a tank volume to contractor area of 0.12 gal./sq. ft. The prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.). See also *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980) (prior art suggested proportional balancing to achieve desired results in the

formation of an alloy).) The Applicants respectfully submit that the Khan et al. reference does not recognize either the spray particle speed or the base-material temperature during removal of an undercoat layer as result-effective variables, i.e., variables that achieve a recognized result. This teaching is only present in the present application, and is not disclosed in any cited prior art reference.

The specification of the present application teaches in a first aspect of the invention that if the spray particle speed is set at less than 300 m/s, than an oxide film is easily deposited on another undercoat layer to be formed where the original undercoat layer has been removed. (See page 6, lines 4-9.) Thus, the present invention teaches that by setting the spray particle speed to be 300 m/s or more, an oxide film is prevented from forming and being brought into contact with another undercoat layer. The Kahn et al. reference does not teach or even suggest such a feature, nor does the Kahn et al. reference recognize the benefits of controlling such a parameter in order to achieve the unrecognized results taught by the present invention. In fact, the Kahn et al. reference does not even mention the spray particle speed parameter at all. The Kahn et al. reference does not even consider the idea of preventing oxidation of the damaged portion when the repairing material is deposited, as the repairing material is stabilized zirconia which has been oxidized in the first place. Accordingly, one of ordinary skill in the art in view of the Kahn et al. reference would not have been motivated to even modify the invention described therein to arrive at the present invention. For at least these reasons, the Applicants respectfully submit that Claim 1 is not unpatentable in view of the Kahn et al. reference.

Furthermore, as noted above, the Khan et al. reference does not disclose or suggest a method including forming another undercoat layer in a removed portion where the original

undercoat layer has been removed by spraying performed in the atmosphere at a base-material temperature of 300°C or less. The specification of the present invention teaches that the temperature of the base-material should be set at 300°C or less in the first aspect of the invention, because if the temperature exceeds 300°C, then the base-material will be heat damaged. The Kahn et al. reference makes no mention of such a teaching.

The Kahn et al. reference does not disclose spraying to form another undercoat layer where the base material is at any specific temperature. The Kahn et al. reference describes drying the slurry coating at a temperature between 20°C and 100°C, and finally heat-treating at 55°C to 750°C to remove the halogens, halogen gas, or residual water. (See paragraph [0014].) However, the Kahn et al. reference does not mention forming another undercoat layer by spraying performed in the atmosphere at a base-material temperature of 300°C or less. The Applicants consider that the Kahn et al. process is carried out as if halogen of a chloride resides, then it will harm the base material. Accordingly, one of ordinary skill in the art in view of the Kahn et al. reference would not have been motivated to even modify the invention described therein to arrive at the present invention. For at least these reasons, the Applicants respectfully submit that Claim 1 is not unpatentable in view of the Kahn et al. reference.

Regarding the rejection based on the Rigney et al. reference, as is clear from Figure 6, the Rigney et al. reference conforms the original material and the metallic coating member. In the Rigney et al. reference, the material for repair replaces the whole surface of a material. For example, as shown in Figure 7, the ceramics (TBC 36) for repair covers the entire surface of the replacement metallic material (34) and the replacement outer coating portion (32). (See column 6, lines 49-50.) Further, in the Rigney et al. reference, as clear from column 7,

lines 5-8, the entire TBC is removed. Therefore, the Rigney et al. reference does not disclose the removal of a damaged portion as in the present invention.

In the Rigney et al. reference, noble metals such as Pt, Rh, and/or Pd are used as a material for repair. (See column 5, lines 53-59.) The noble metal is also used to retain the thickness of the discrete surface area. (See Claims 1 and 7.) Therefore, in the Rigney et al. reference, the repair is costly. Compared to the Rigney et al. reference, the present invention does not require replacing the entire surface of the material, thereby reducing the cost of the repair.

Additionally, as noted in the Official Action, the Rigney et al. reference does not teach or even suggest several features recited in Claim 1 of the present application. For example, the Official Action notes that the Rigney et al. reference does not disclose or suggest a method including forming another undercoat layer in a removed portion where the original undercoat layer has been removed by spraying performed in the atmosphere at a spray particle speed of 300 m/s or more. In fact, the Rigney et al. reference makes no mention of any spray particle speed. Furthermore, the Official Action notes that the Rigney et al. reference does not disclose or suggest a method including forming another undercoat layer in a removed portion where the original undercoat layer has been removed by spraying performed in the atmosphere at a base-material temperature of 300°C or less. However, the Official Action states that in the absence of a showing of criticality, the selection of optimum values for the temperature and spray velocity would have been within the skill of one practicing in the art.

As noted above, MPEP 2144.05 III. B. states that only result-effective variables can be optimized. This section notes that "[a] particular parameter must first be recognized as a

result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." The Applicants respectfully submit that the Rigney et al. reference does not recognize either the spray particle speed or the base-material temperature during removal of an undercoat layer as result-effective variables, i.e., variables that achieve a recognized result. This teaching is only present in the present application, and is not disclosed in any cited prior art reference.

The specification of the present application teaches in a first aspect of the invention that if the spray particle speed is set at less than 300 m/s, than an oxide film is easily deposited on another undercoat layer to be formed where the original undercoat layer has been removed. (See page 6, lines 4-9.) Thus, the present invention teaches that by setting the spray particle speed to be 300 m/s or more, an oxide film is prevented from forming and being brought into contact with another undercoat layer. The Rigney et al. reference does not teach or even suggest such a feature, nor does the Rigney et al. reference recognize the benefits of controlling such a parameter in order to achieve the unrecognized results taught by the present invention. For at least this reason, the Applicants respectfully submit that Claim 1 is not unpatentable in view of the Rigney et al. reference.

Furthermore, as noted above, the Rigney et al. reference does not disclose or suggest a method including forming another undercoat layer in a removed portion where the original undercoat layer has been removed by spraying performed in the atmosphere at a base-material temperature of 300°C or less. The specification of the present invention teaches that the temperature of the base-material should be set at 300°C or less in the first aspect of the

invention, because if the temperature exceeds 300°C, then the base-material will be heat damaged. The Rigney et al. reference makes no mention of such a teaching.

The Rigney et al. reference does not disclose spraying to form another undercoat layer where the base material is at any specific temperature range. The Rigney et al. reference describes a temperature range of 900-1150°C for the heat treatment of a metal deposited on surface (30) to diffuse the metal into coating (22). (Column 6, lines 9-11.) However, the Rigney et al. reference does not mention forming another undercoat layer by spraying performed in the atmosphere at a base-material temperature of 300°C or less. For at least this reason, the Applicants respectfully submit that Claim 1 is not unpatentable in view of the Rigney et al. reference.

Accordingly, the Applicants submit that a *prima facie* case of obviousness has not been established with respect to Claim 1. Thus, the Applicants respectfully request the withdrawal of the obviousness rejections of Claim 1.

Claim 4 is considered allowable for the reasons advanced for Claim 1 from which it depends. This claim is further considered allowable as it recites other features of the invention that are neither disclosed, nor suggested by the applied references when those features are considered within the context of Claim 1.

Claim 6 of the present application recites a method of repairing a Ni-based alloy part having an undercoat layer and a topcoat layer stacked on a Ni-based alloy base when the topcoat layer is damaged. The method comprises the steps of removing a damaged portion of the topcoat layer and a denatured portion of the undercoat layer corresponding to the damaged portion, applying spraying to a removed portion where the undercoat layer has been removed at reduced pressure, a spray particle speed of less than 300 m/s, and a base-material

temperature of 600°C or less, and forming another topcoat layer in the damaged portion of the topcoat layer. A layer formed of a material having excellent oxidation resistance is used as the another undercoat layer, and a layer formed of a material having excellent oxidation resistance is used as the another topcoat layer.

Neither the Khan et al. reference nor the Rigney et al. reference disclose or suggest a method including applying spraying to a removed portion where the undercoat layer has been removed at a spray particle speed of less than 300 m/s. As noted above, the Kahn et al. and the Rigney et al. references do not even discuss the issue of spray particle speed curing the spraying application of an undercoat layer. The Applicants respectfully submit that the Khan et al. reference and the Rigney et al. reference do not recognize the spray particle speed during removal of an undercoat layer as a result-effective variable. Thus, these references cannot be said to render obvious a spray particle speed of less than 300 m/s, as recited in Claim 6. Furthermore, the Sangeeta et al. reference does not appear to supplement this deficiency. The specification of the present application teaches that the spray particle speed in the second aspect of the invention is set at less than 300 m/s, because if the spray particle speed is 300 m/s or more in the second aspect, then the energy density of the frame increases at low pressure causing a substantial increase in the base-material temperature. None of the references disclose such a teaching, and therefore one of ordinary skill in the art would not have had any motivation to modify those references to arrive at the present invention as recited in Claim 6. Thus, for at least this reason, the Applicants respectfully submit that Claim 6 is not unpatentable in view of the above combination.

Additionally, as described above, the invention of the Rigney et al. reference replaces the entire surface of the material, and uses a noble metal as a repair material. The invention

of the Khan et al. reference is a method for removing and repairing a topcoat layer and an undercoat layer. On the other hand, the present invention does not require the use of a noble metal as a repair material. If a noble metal is used, the repair will be costly. In the present invention, the topcoat layer and the undercoat layer are repaired separately. This is to maintain the function of both layers, as the function of the two layers are different. In the present invention, oxidation resistance is especially required in the in the undercoat layer. This is to prevent oxidation of the substrate, as it is formed of metal. Thermal insulation is also required, as the topcoat layer is usually porous.

If the damaged portion is removed, and the topcoat layer and the undercoat layer are repaired using the same material as the topcoat, air will enter from the porous portion. As a result, the substrate will be oxidized, and the attached topcoat layer will be peeled off. On the other hand, if the damaged portion is removed, and the topcoat layer and the undercoat layer are repaired using the same material as the undercoat layer, as the temperature is high during operation, the air directly contacts the layer. As a result, the entire undercoat layer material is oxidized, loses its function as a protection film, and the substrate is oxidized. Normally, the topcoat layer is porous and air is in contact with MCrAIY. However, air is not in direct contact with MCrAIY, but is in contact with MCrAIY through the topcoat layer. Thus, when air is brought into contact under a high temperature, an aluminum oxide film is generated on the surface of MCrAIY, and oxidation resistance is expressed.

From the above, the structure of the amended Claim 1 is different from the structure of the inventions disclosed in the Rigney et al. and Khan et al. references. These references do not suggest the special advantage of partially repairing the coating layer, improving the durability of the topcoat layer, and reducing the cost of the repair.

The Sangeeta et al. reference describes a method for depositing a slurry of metal on the substrate to form a layer containing a noble metal. The Official Action indicates that the Sangeeta et al. reference carries out the treatment under low pressure. Indeed, column 6, lines 2-4, of the Sangeeta et al. reference describe "a vacuum." However, in the Sangeeta et al. reference, this means that the diffusion heat treatment may be carried out in a vacuum. On the other hand, the present invention applies plasma spraying at reduced pressure, and the timing of applying reduced pressure is different from that of the Sangeeta et al. reference. Although the Sangeeta et al. reference (column 6, line 62, through column 7, line 3) describes "a vacuum" and treatment in vacuum, the descriptions relate to an atmosphere during heat treatment, and are not related to an atmosphere during the attachment of the plasma spraying material to the substrate as in the present invention.

In the Sangeeta et al. reference, as clear from the description of claim 1, the step for removing volatile materials from the slurry is necessary. In the Sangeeta et al. reference, it is likely that holes will be generated in the slurry during the process. On the other hand, in the present invention, it is unnecessary to remove the volatile materials.

In the Sangeeta et al. reference, during the process of removing the volatile materials from the slurry, if the temperature is raised too quickly, the rapid evaporation of volatile components can lead to bubbling, which may result in coating defects (column 5, lines 5-11). Therefore, in the Sangeeta et al. reference, complicated temperature control is necessary. On the other hand, the present invention does not need any complicated temperature control as the above, and no coating defects occur.

Accordingly, the Applicants submit that a *prima facie* case of obviousness has not been established with respect to Claim 6. Thus, the Applicants respectfully request the

withdrawal of the obviousness rejection of Claim 6.

Claim 9 is considered allowable for the reasons advanced for Claim 6 from which it depends. This claim is further considered allowable as it recites other features of the invention that are neither disclosed, nor suggested by the applied references when those features are considered within the context of Claim 6.

Consequently, in view of the above discussion, it is respectfully submitted that the present application is in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully Submitted,

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